Integration with Ethernet and RS-232 Devices

Revision A

Overview

HomeWorks QS is a system capable of integrating with other equipment in many ways. In most instances this integration can be accomplished using TCP/IP and an Ethernet network, however, it is sometimes necessary to integrate with legacy devices utilizing RS-232 serial connections. HomeWorks QS does not include an on-board RS-232 port, but a simple inexpensive device can be added that will convert Ethernet to RS-232 to accomplish this integration. This application note describes how to set up and configure integration with the HomeWorks QS system using both Ethernet and RS-232. There are four integration scenarios that will be described in this document.

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Scenario 1: Integration with Ethernet Connected Devices Using the Lutron Integration Protocol

Overview:

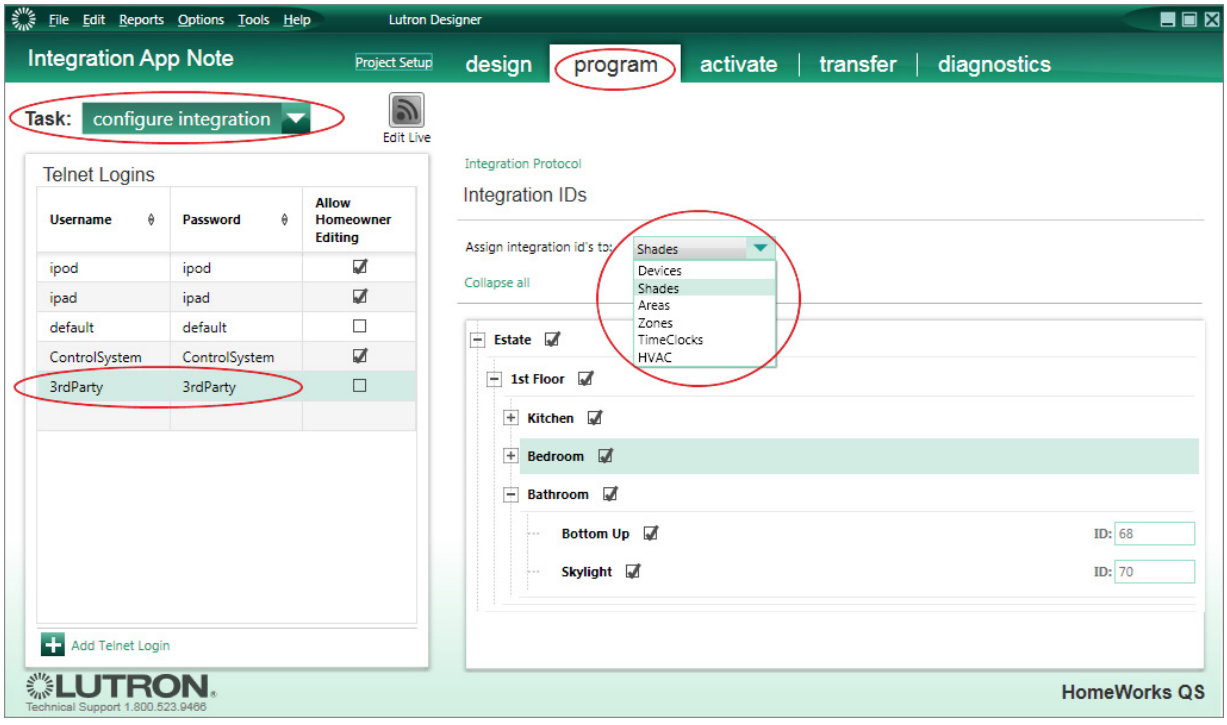
In this scenario, integration between HWQS and 3rd-party devices is accomplished using an Ethernet connection and the Lutron Integration Protocol, which is well documented and freely available. This is the most common type of integration with a HWQS system. Many 3rd-party systems and devices have fully functional two-way integration drivers for HWQS that utilize the Lutron Integration Protocol and allow for simplified bi-directional integration. The 3rd-party device must open and maintain a Telnet session with the HWQS system.

Equipment Required:

All versions of HWQS software can be used in this scenario. No additional equipment is required when integrating with Ethernet connected devices using the Lutron Integration Protocol.

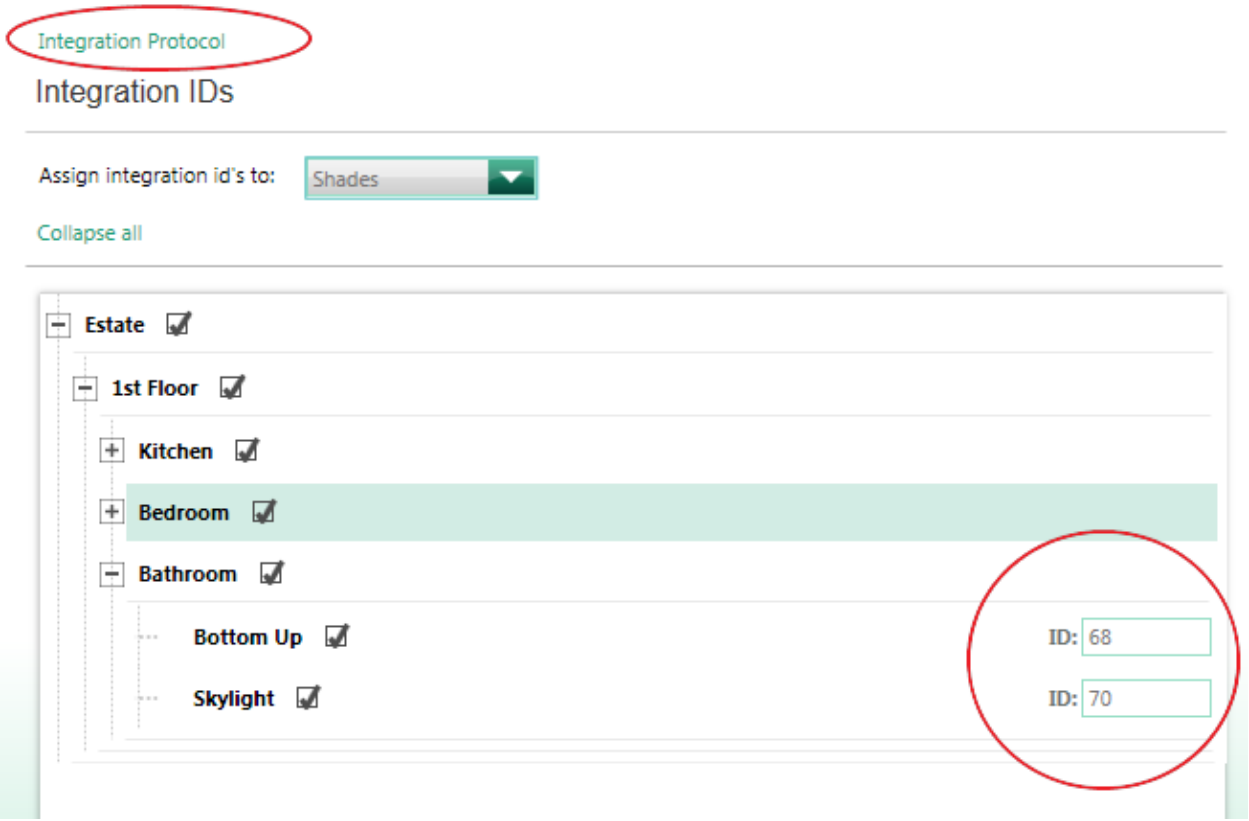
Set Up Steps:

1. Configure integration IDs and Telnet logins in the HWQS software. This is accomplished on the "program" tab under the "configure integration" task in the drop-down menu. A separate Telnet login must be created for each device. Be sure to enable integration IDs for all the devices, shades, areas, zones, timeclocks, and HVAC controls that you desire to integrate with. Everything should be checked by default. If any of these are not checked, they will not be available through integration. These settings are also used by the Lutron Home Control+ mobile apps, so do not uncheck anything you would like to access from these apps.



2. Configure the Ethernet connected devices to establish a Telnet session with the HWQS processor. This is done using the 3rd-party device or associated software. Consult that product's documentation for details.

3. Configure the 3rd-party devices and systems to utilize the Lutron Integration Protocol with the appropriate integration IDs. Many 3rd-party devices have drivers for Lutron systems and devices that will allow easy integration between the two. In other cases, you may be required to configure the 3rd-party device to send the appropriate command. Consult the Lutron Integration Protocol, available within the HWQS software for details. The Integration ID is listed beside each device you have enabled for integration.



4. Connect all devices to the same Ethernet network and subnet (refer to the HWQS Networking Guide for details). The devices must be able to communicate over the Ethernet network for the integration to function properly.

Scenario 2: Integration with Ethernet Connected Devices Using Custom Integration Commands

Overview:

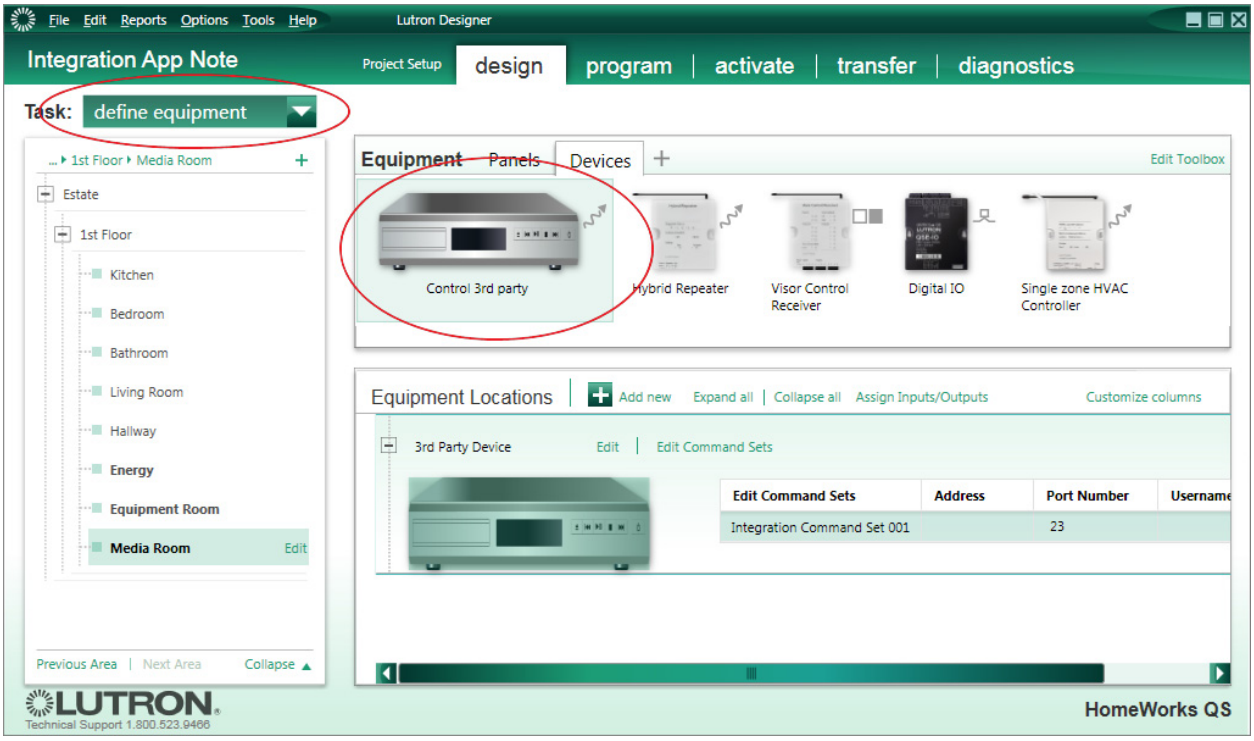
In this scenario, integration between HWQS and 3rd-party devices is accomplished using an Ethernet connection and the 3rd-party device's communication commands. This type of integration is commonly used when the 3rd-party device is capable of being controlled, however the HWQS system will not receive any feedback from the device. Common examples include spa/pool controllers, A/V components, and thermostats. The HWQS system is the master and the 3rd-party device is the slave. The HWQS system will open and maintain the Telnet session or TCP connection with the 3rd-party device.

Equipment Required:

HWQS software version 2.0 or later must be used in this scenario. No additional equipment is required when integrating with Ethernet connected devices using custom integration commands.

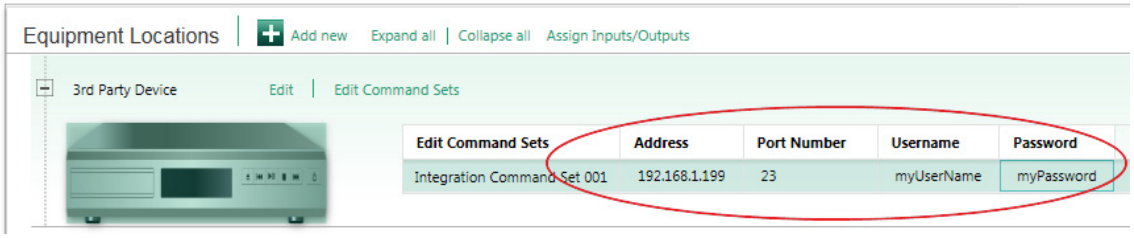
Set Up Steps:

1. Add a "Control 3rd Party" device to your project on the "design" tab under the "define equipment" task. A "Control 3rd Party" device must be added for each device you intend to integrate with using custom integration commands. If the device is not shown in your toolbox, you may need to edit your toolbox to add the device.

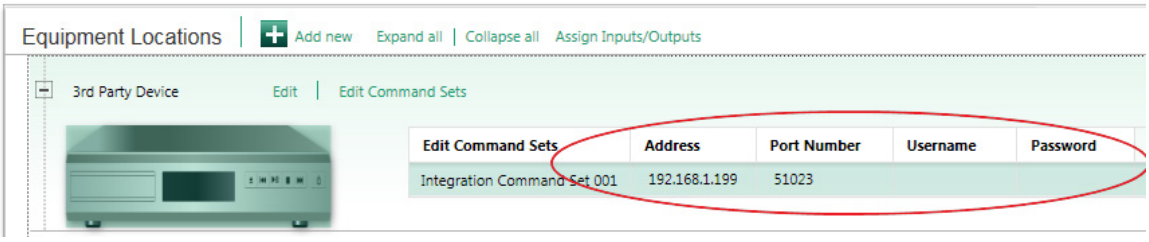


2. The Ethernet integration can be accomplished in one of two ways: using Telnet (the HWQS system will open and maintain a Telnet session with the 3rd-party device) or by sending raw TCP data to a specified port on the 3rd-party device.

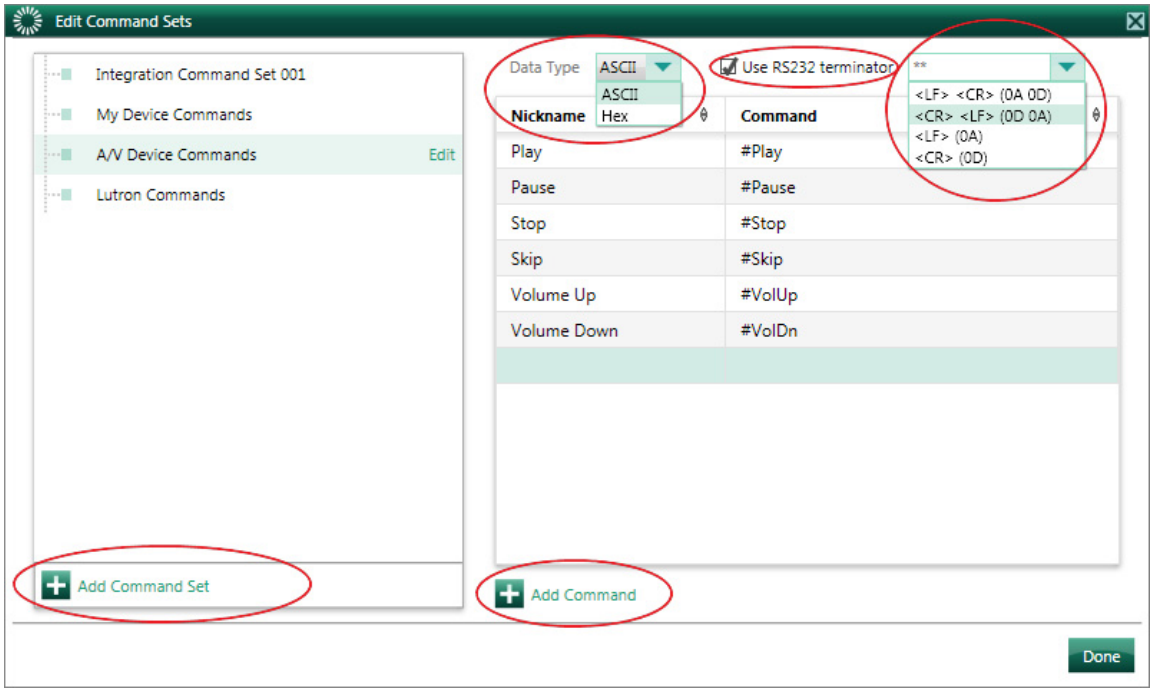
If using Telnet, the IP address of the 3rd-party device, Telnet port (default is 23), and the Telnet username and password must be entered. These settings must match the 3rd-party device.



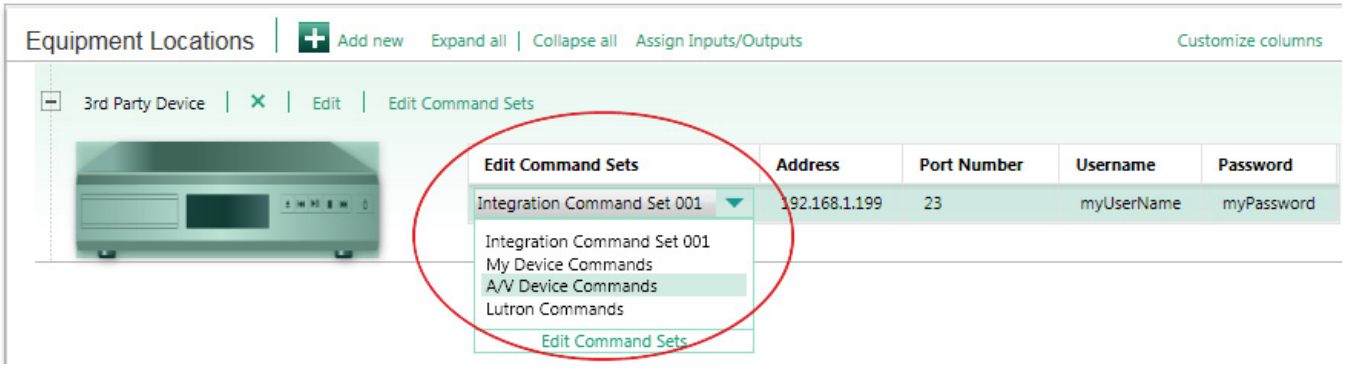
If sending raw TCP data, the username and password fields must be left blank, however, the IP address of the 3rd-party device must be entered in the address field and the TCP port to send the data to must be entered in the Port field.



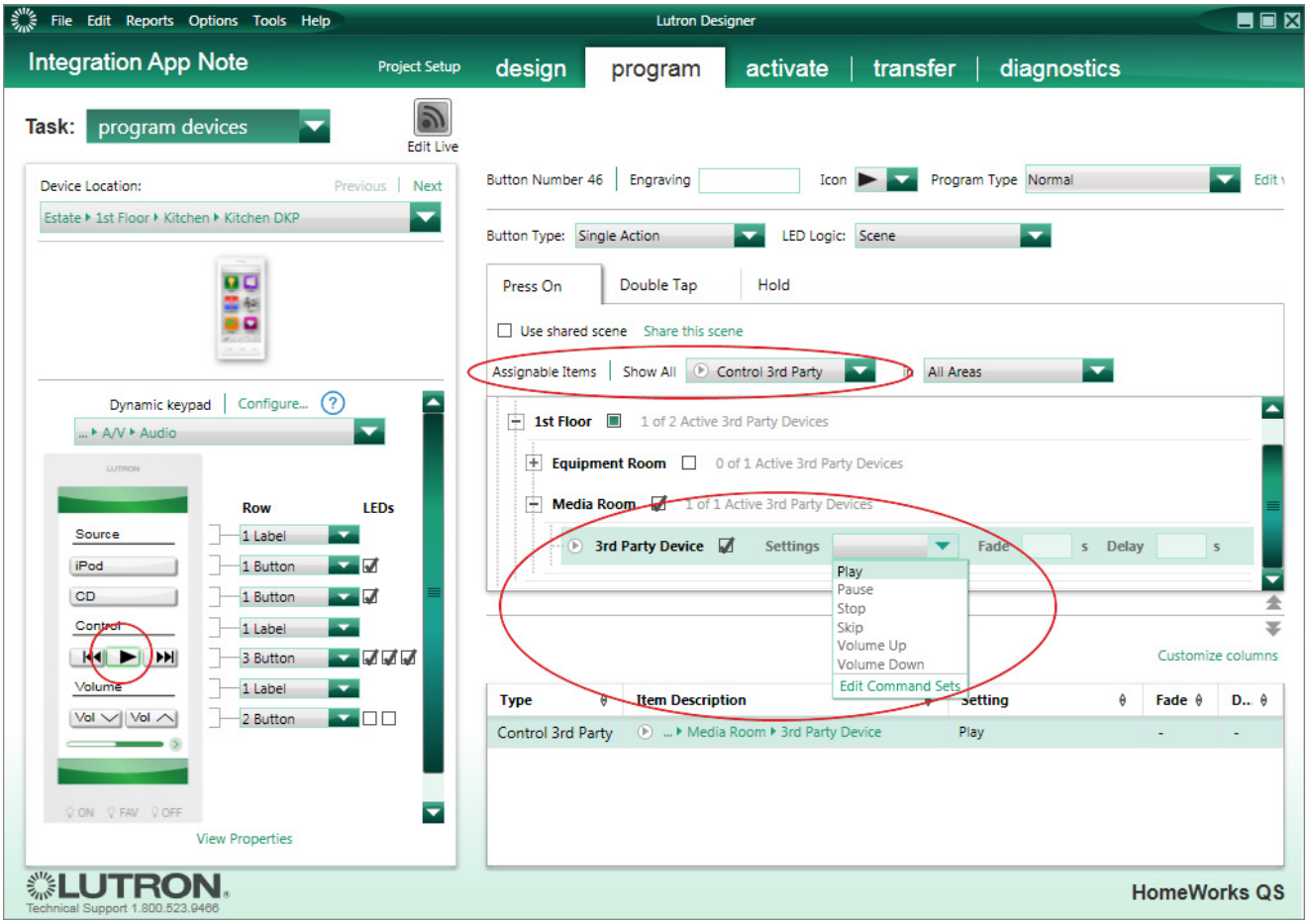
3. "Edit Command Sets" to create a custom command set for the 3rd-party device. This screen can be opened by clicking the "Edit Command Sets" link in the "Equipment Locations" box, or by going to the "Tools" menu and choosing "Edit Command Sets". Once in this window, you can "Add Command Sets" and "Add Commands" to existing command sets. The data can be entered in ASCII text or Hex values. You also have the option of appending an RS-232 terminator to each command, if required by the 3rd-party device. Telnet typically requires <CR> <LF> terminators, but this can vary based on the device used.



4. Assign this command set to the 3rd-party device in the project. This can be chosen from the drop-down box on the device.

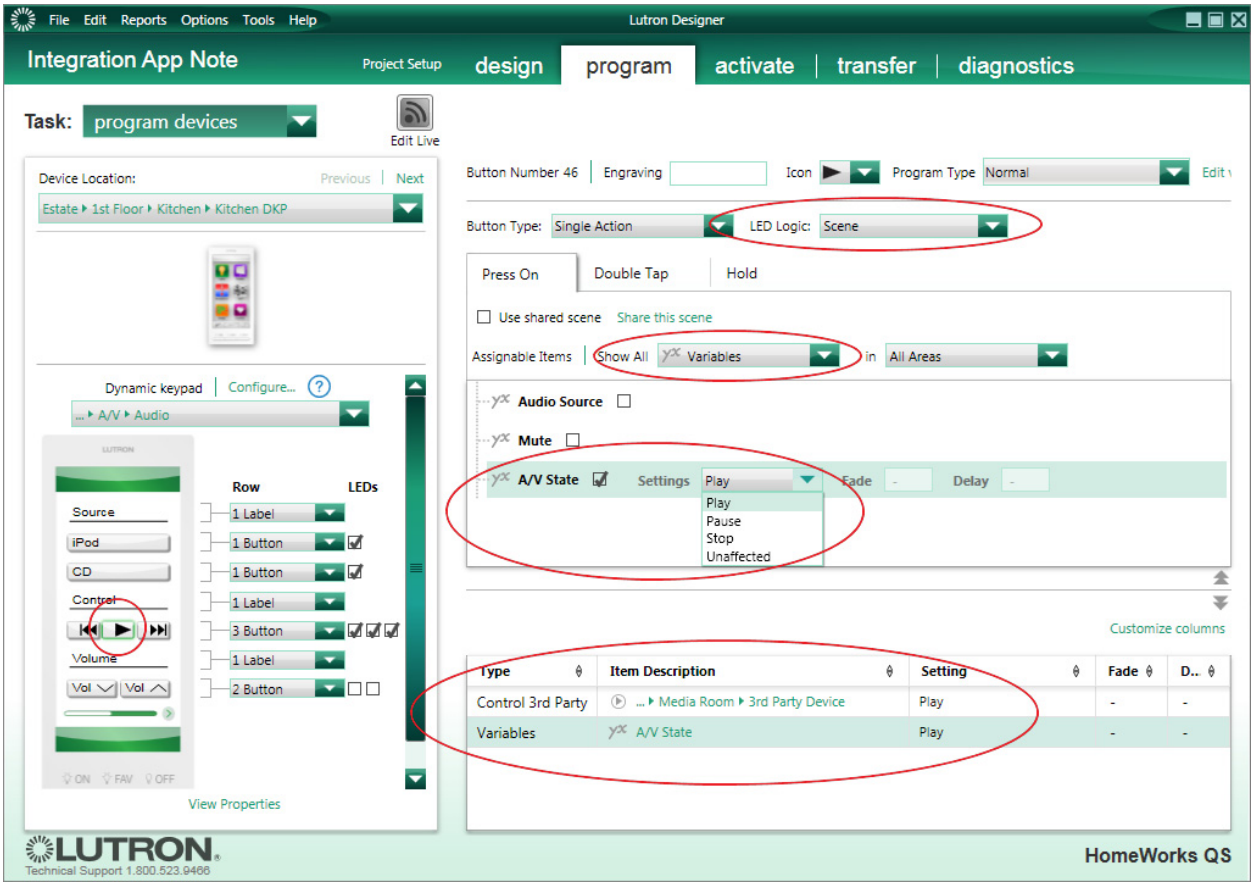


5. Program keypads, timeclocks, etc. to send commands to the 3rd-party device. This is done on the "program" tab. Choose "Control 3rd Party" from the "Assignable Items" list to view the devices in your project. The "Settings" drop down will display the integration commands that were configured for that device.



6. If you would like LED feedback on the buttons, you should create a state variable and assign it to the button in addition to assigning the custom output strings. Feedback will not be received from the 3rd-party device, so by using a state variable, the HWQS system can track what the 3rd-party device was commanded to do from the HWQS system. For example, if I am controlling a media playback device with commands to Play, Pause, and Stop, I can

create a state variable with these same states and assign the variable states to the button that sends the corresponding command to the media playback device. Using scene LED logic on the button will ensure that the LED will be lit only when that state is true.



7. Connect all devices to the same Ethernet network and subnet (refer to the HWQS Networking Guide for details). The devices must be able to communicate over the Ethernet network for the integration to function properly.

Scenario 3: Integration with RS-232 Devices Using the Lutron Integration Protocol

Overview:

In this scenario, integration between HWQS and 3rd-party devices is accomplished using an RS-232 serial connection and the Lutron Integration Protocol, which is well documented and freely available. Many 3rd-party systems and devices have fully functional two-way integration drivers for HWQS that utilize the Lutron Integration Protocol and allow for simplified bi-directional integration. An Ethernet to RS-232 converter will be required, since the HWQS system has Ethernet connections and the 3rd-party device has only an RS-232 port. The converter device must open and maintain a Telnet session with the HWQS system, which will then allow the Lutron Integration Protocol data to pass through to the RS-232 port. This scenario is identical to Scenario 1 in this document with the exception that the Ethernet to RS-232 converter device is used between the HWQS system and the 3rd-party device.

Equipment Required:

All versions of HWQS software will work with this scenario. An Ethernet to RS-232 converter device is required to communicate with RS-232 devices from a HWQS system. There are many devices with these capabilities, however, two such devices that Lutron has had success with are the following:

Digi One SP
www.digi.com

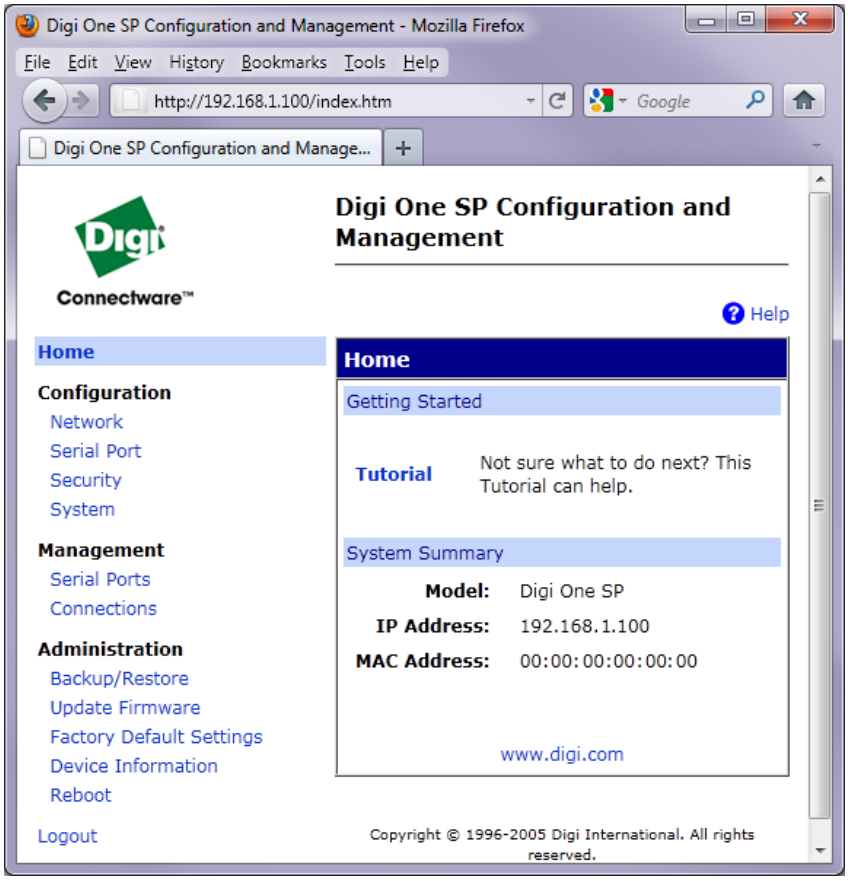
B & B Electronics ES1A
www.bb-elec.com

Set Up Steps:

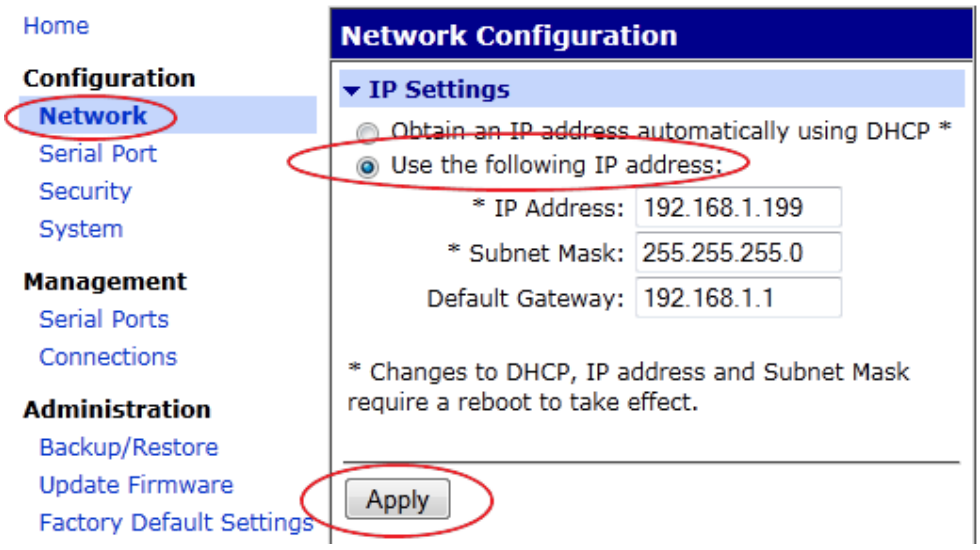
1. Connect the Ethernet port on the Ethernet to RS-232 converter device to the same Ethernet network as the HWQS system and your computer. A standard Ethernet patch cable can be used.

2. Open the web-based configuration and management portal for the device. This can be accomplished by using the setup utility included with the device, or by using the web-based configuration and management portal. The steps contained in this document are for the Digi

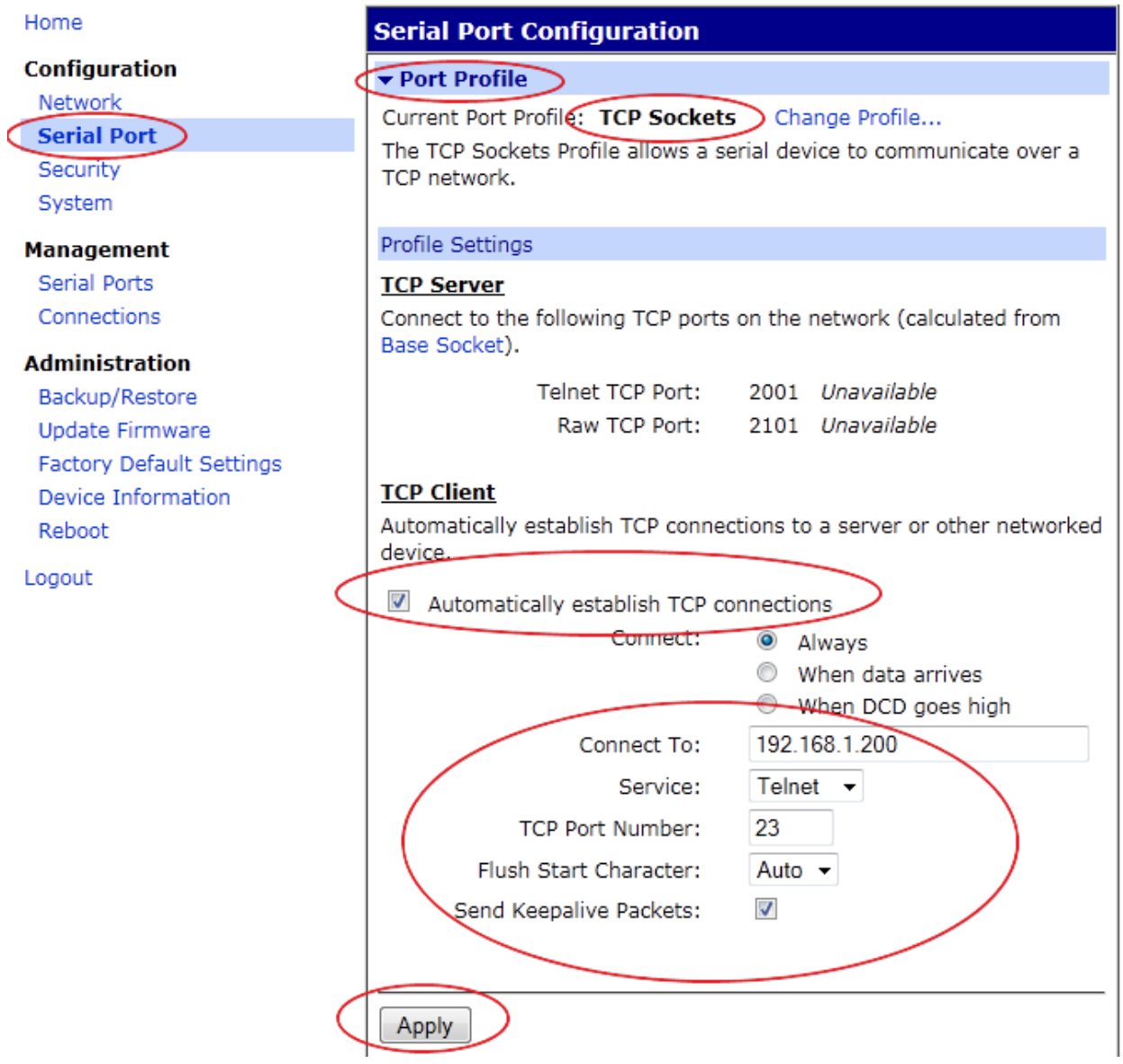
One SP device using the web-based setup, but are similar to those for the B & B Electronics ES1A device. The configuration and management portal is accessed by pointing your internet browser to the IP address of the device. The default username is "root" and the default password is "dbps". The home screen is shown below.



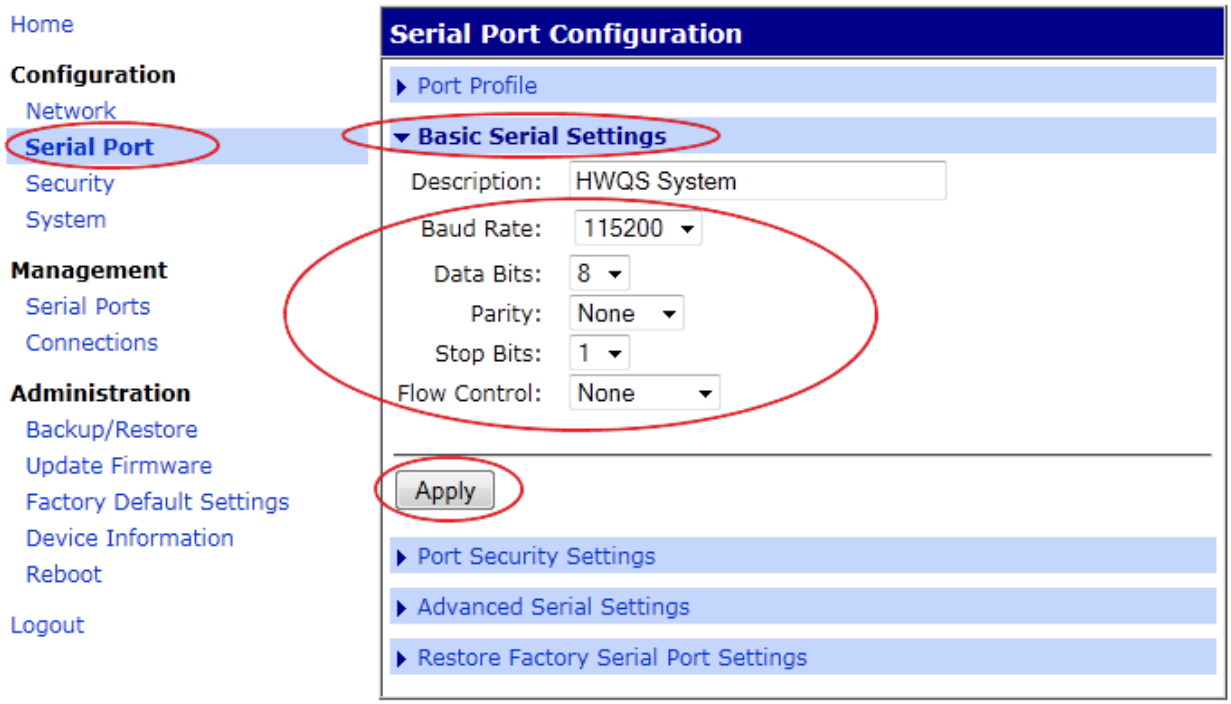
3. Configure the network settings on the Ethernet to RS-232 converter device by clicking on the "Network" option on the left side. It is recommended to use a static IP address. This address should be outside the DHCP range of the router. The device must be on the same network and subnet as the HWQS processor. Be sure to Apply the settings. The device may need to reboot for the settings to take effect.



4. Configure the serial port port profile on the converter device by clicking on the "Serial Port" option on the left side and then selecting "Port Profile" at the top. Choose the "TCP Sockets" port profile. Under "TCP Client", check the box to "Automatically establish TCP connections". Enter the IP address of the HWQS processor in the "Connect To:" field. Choose "Telnet" in the "Service:" field. Enter "23" in the "TCP Port Number:" field. Be sure to Apply the settings. The image below contains the appropriate settings, however, you must replace the displayed IP address with the IP address of your HWQS processor.



5. Configure the serial port parameters by clicking the "Serial Port" option on the left side and then selecting "Basic Serial Settings". Set the baud rate, data bits, parity, stop bits, and flow control. These are determined by the 3rd-party device that will be connected to the RS-232 port on the device, and must match.



6. Refer to Scenario 1 in this document to set up the HWQS system to use the Lutron Integration Protocol. From the HWQS system perspective, this scenario is identical to Scenario 1, as the Ethernet to RS-232 conversion occurs outside the HWQS system.

7. Connect an RS-232 cable between the 3rd-party device and the converter. Depending on the configuration of the 3rd-party device, you may require a null-modem cable and/or gender adapters. The Ethernet to RS-232 converter devices in this document are DTE (Data Terminal Equipment) devices.

8. The Ethernet to RS-232 converter device will automatically open the Telnet session with the HWQS processor, however, the 3rd-party device must send the Telnet username/password via RS-232 when prompted. After the login occurs, the 3rd-party device can then utilize the Lutron Integration Protocol, as if the device was connected via Ethernet.

Scenario 4: Integration with RS-232 Devices Using Custom Integration Commands

Overview:

In this scenario, integration between HWQS and 3rd-party devices is accomplished using an RS-232 connection and the 3rd-party device's communication commands. This type of integration is commonly used when the 3rd-party device is capable of being controlled, however the HWQS system will not receive any feedback from the device. Common examples include spa/pool controllers, A/V components, and thermostats. The HWQS system is the master and the 3rd-party device is the slave. An Ethernet to RS-232 converter will be required, since the HWQS system has Ethernet connections and the 3rd-party device has only an RS-232 port. The HWQS processor will open and maintain a TCP connection with the converter device, which will then allow the custom command strings to pass through to the RS-232 port. This scenario is identical to Scenario 2 in this document with the exception that the Ethernet to RS-232 converter device is used between the HWQS system and the 3rd-party device.

Equipment Required:

HWQS software version 2.0 or later must be used in this scenario. An Ethernet to RS-232 converter device is required to communicate with RS-232 devices from a HWQS system. There are many devices with these capabilities, however, two such devices that Lutron has had success with are the following:

Digi One SP
www.digi.com

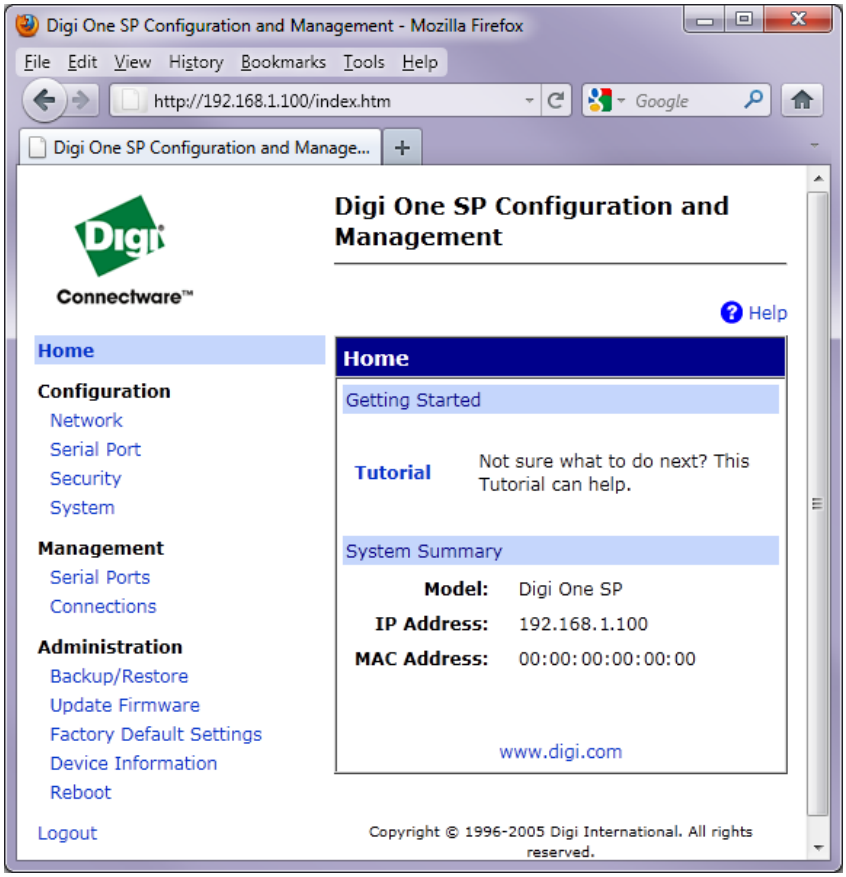
B & B Electronics ES1A
www.bb-elec.com

Set Up Steps:

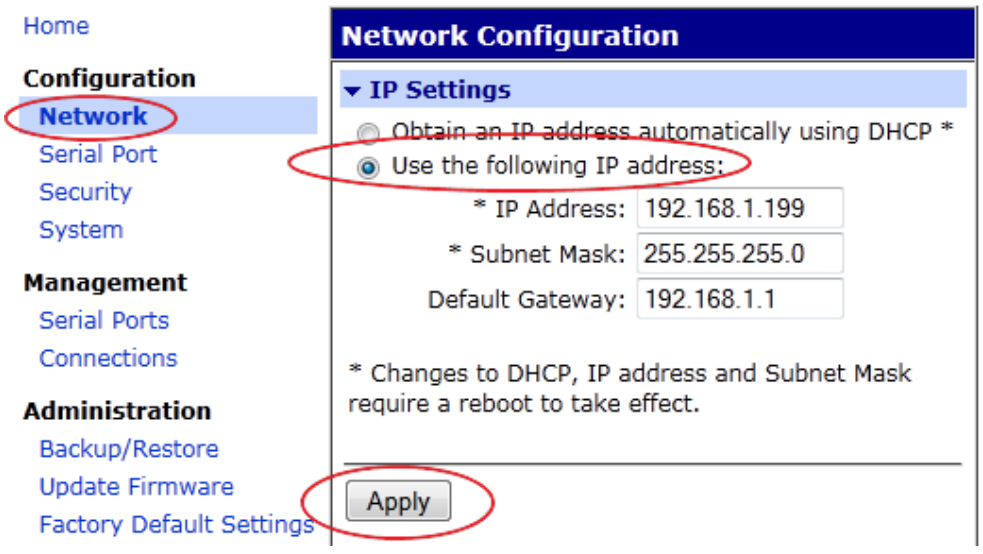
1. Connect the Ethernet port on the Ethernet to RS-232 converter device to the same Ethernet network as the HWQS system and your computer. A standard Ethernet patch cable can be used.

2. Open the web-based configuration and management portal for the device. This can be accomplished by using the setup utility included with the device, or by using the web-based

configuration and management portal. The steps contained in this document are for the Digi One SP device using the web-based setup, but are similar to those for the B & B Electronics ES1A device. The configuration and management portal is accessed by pointing your internet browser to the IP address of the device. The default username is "root" and the default password is "dbps". The home screen is shown below.



3. Configure the network settings on the Ethernet to RS-232 converter device by clicking on the "Network" option on the left side. It is recommended to use a static IP address. This address should be outside the DHCP range of the router. The device must be on the same network and subnet as the HWQS processor. Be sure to Apply the settings. The device may need to reboot for the settings to take effect.

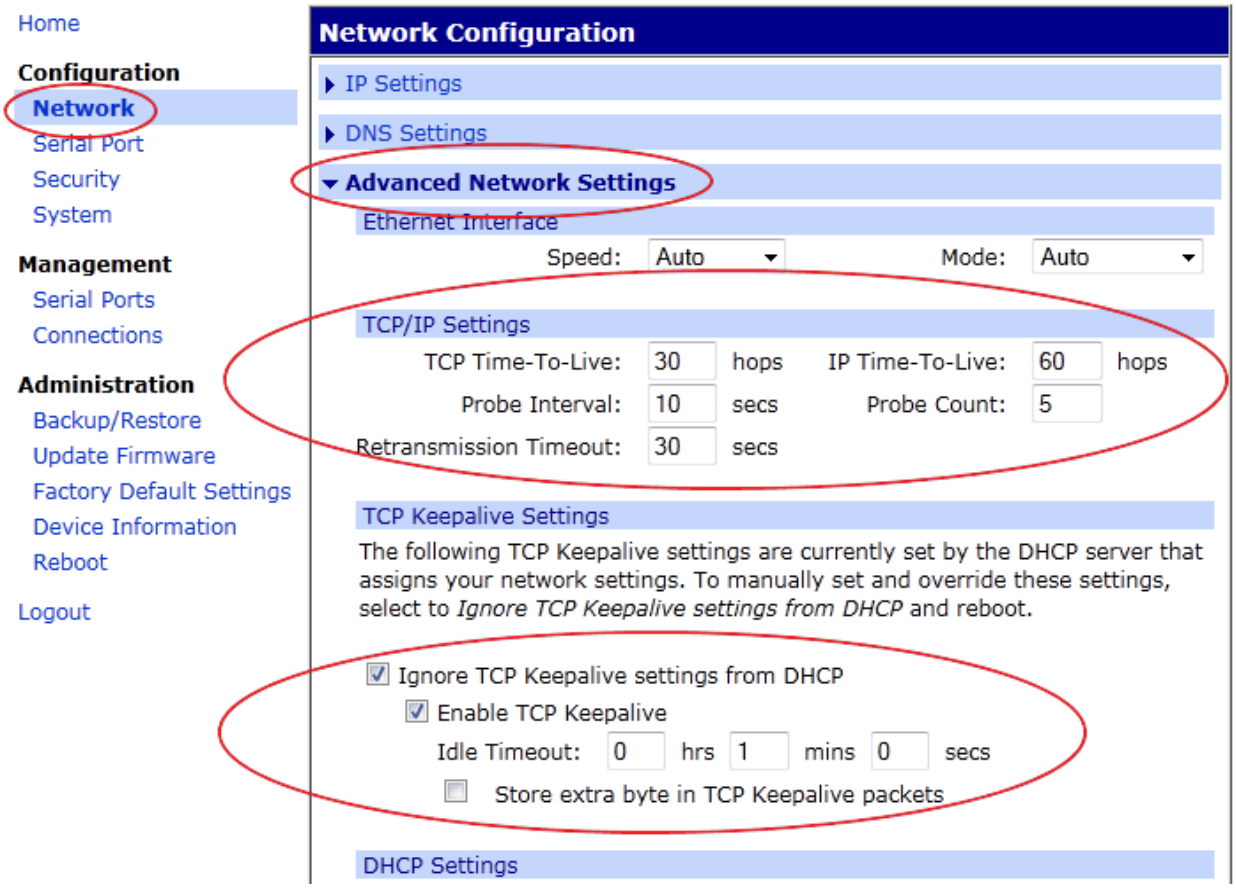


4. Configure the Advanced Network Settings on the Ethernet to RS-232 converter device by clicking on the "Network option on the left side and then clicking on "Advanced Network Settings". The settings must be set to the following:

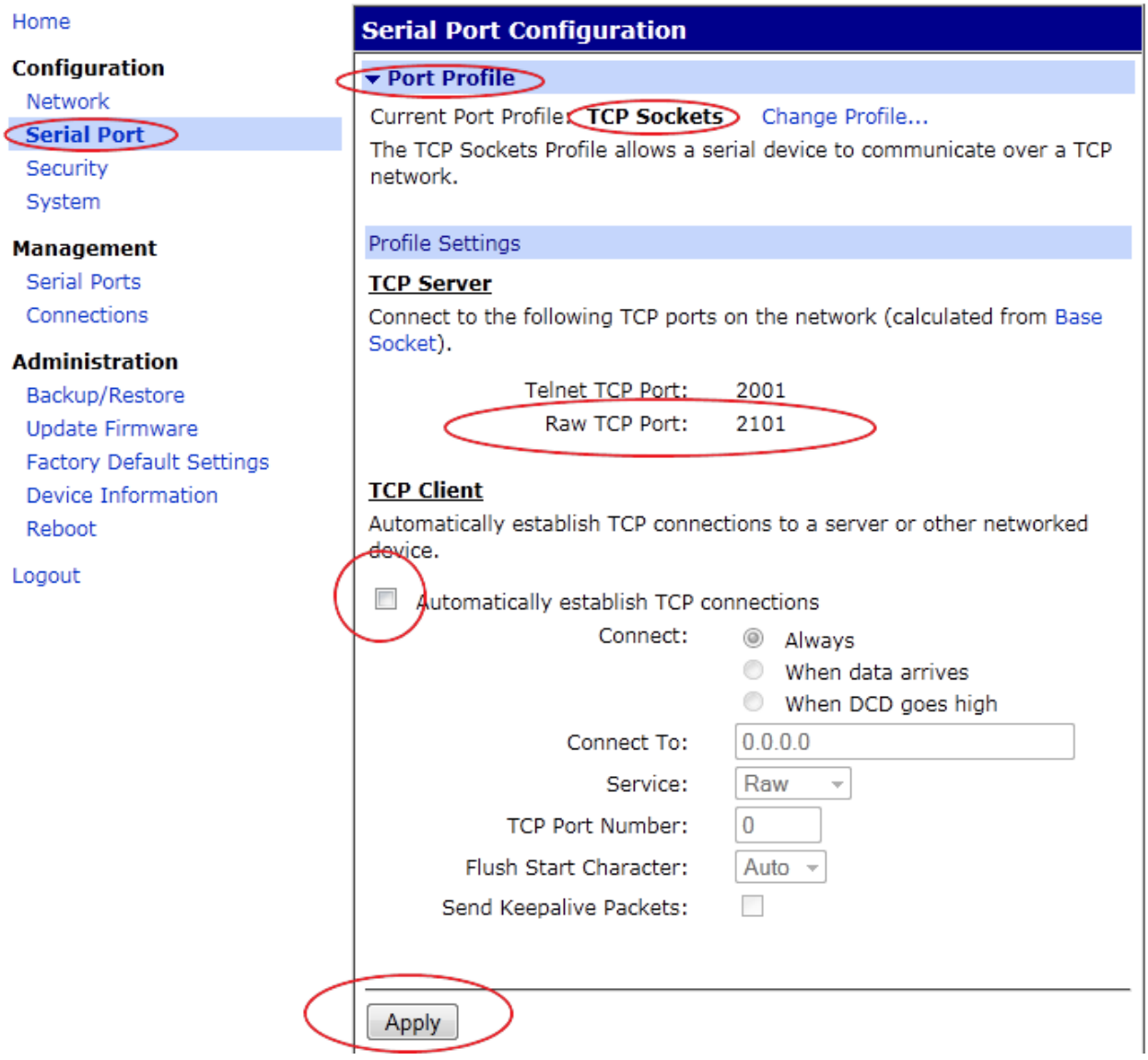
TCP Time-To-Live:	30 hops
IP Time-To-Live:	60 hops
Probe Interval:	10 secs
Probe Count:	5
Retransmission Timeout:	30 secs

Ignore TCP Keepalive settings from DHCP	(checked)
Enable TCP Keepalive	(checked)
Idle Timeout:	1 min

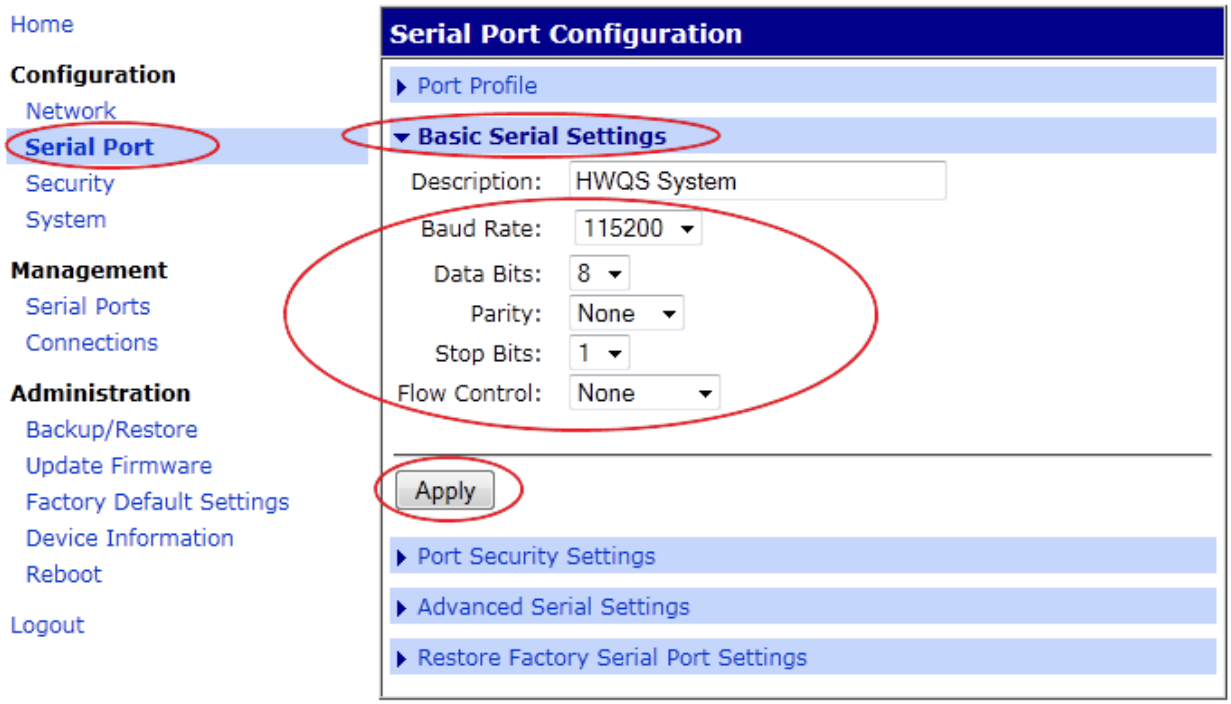
The settings are shown below. Be sure to Apply the settings at the bottom of the page when done. These settings are important because they allow the HWQS processor to maintain the connection with the converter device and quickly re-establish the connection if it is lost.



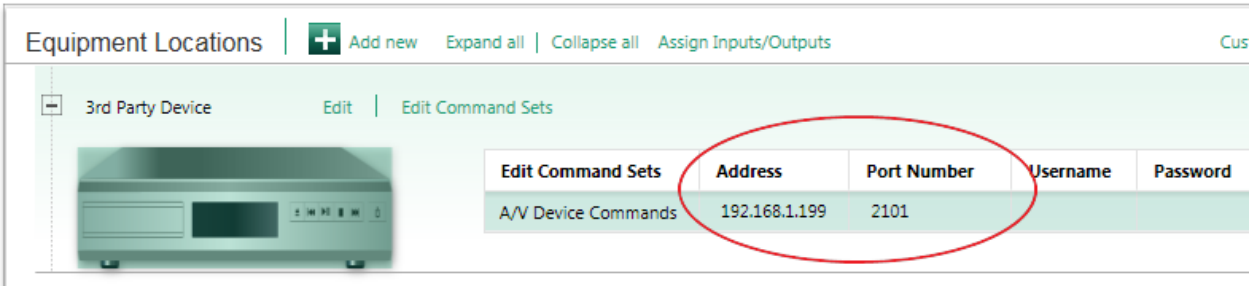
5. Configure the serial port profile on the converter device by clicking on the "Serial Port" option on the left side and then selecting "Port Profile" at the top. Choose the "TCP Sockets" port profile. Make note of the "Raw TCP Port" number (2101) listed under the "TCP Server". This is the port you will program the HWQS software to send the 3rd-party device commands to. Ensure the box is unchecked to "Automatically establish TCP connections". Be sure to Apply the settings. The image below contains the appropriate settings.



6. Configure the serial port parameters by clicking the "Serial Port" option on the left side and then selecting "Basic Serial Settings". Set the baud rate, data bits, parity, stop bits, and flow control. These are determined by the 3rd-party device that will be connected to the RS-232 port on the device, and must match.



7. Refer to Scenario 2 in this document to set up the HWQS system to use custom integration commands to communicate with a 3rd-party device. For the Address of the 3rd-party device in the HWQS software, use the IP address of the converter device set in step 3 followed by a colon and the Raw TCP port number from step 5. Leave the Username and Password fields blank. From the HWQS system perspective, this scenario is identical to Scenario 2, as the Ethernet to RS-232 conversion occurs outside the HWQS system.



8. Connect an RS-232 cable between the 3rd-party device and the converter. Depending on the configuration of the 3rd-party device, you may require a null-modem cable and/or gender adapters. The Ethernet to RS-232 converter devices in this document are DTE (Data Terminal Equipment) devices.

9. The HWQS system will send the command strings to the Ethernet to RS-232 converter device on the specified port, which will then be passed out the RS-232 port to the 3rd-party device. No login/password is required.